DEFENSE INFORMATION SYSTEMS AGENCY
P. O. BOX 549
FORT MEADE, MARYLAND 20755-0549

IN REPLY
REFER TO: Joint Interoperability Test Command (JTE)

MEMORANDUM FOR DISTRIBUTION **11 May 11**

SUBJECT: Special Interoperability Test Certification of the Cisco® Nexus® 5000 Series Release Nexus Operating System (NX-OS®) 4.2(1)N1(1)

References: (a) DoD Directive 4630.05, "Interoperability and Supportability of Information Technology (IT) and National Security Systems (NSS)," 5 May 2005
(b) CJCSI 6212.01E, "Interoperability and Supportability of Information Technology and National Security Systems," 15 December 2008
(c) through (e), see Enclosure 1

1. References (a) and (b) establish the Defense Information Systems Agency (DISA), Joint Interoperability Test Command (JITC), as the responsible organization for interoperability test certification.

2. The Cisco® Nexus® 5020 Release NX-OS® 4.2(1)N1(1) is hereinafter referred to as the System Under Test (SUT). The SUT meets all of its critical interoperability requirements and is certified for joint use within the Defense Information System Network (DISN) as an Assured Services Local Area Network (ASLAN) Layer 2 access switch. The SUT is certified as interoperable for joint use with other ASLAN components listed on the Unified Capabilities (UC) Approved Products List (APL) with the following interfaces: 1000/10000 Base SX/LX and 1000/10000 BaseT. The SUT meets the critical interoperability requirements set forth in Reference (c), using test procedures derived from Reference (d). The Cisco® Nexus® 5010 switch employs the same software and hardware as the SUT. The JITC analysis determined this system to be functionally identical to the SUT for interoperability certification purposes and it is also certified for joint use.

The SUT is certified to support Assured Services within an ASLAN. If a component meets the minimum requirements for deployment in an ASLAN, it also meets the lesser requirements for deployment in a non-ASLAN. Non-ASLANs are "commercial grade" and provide support to Command and Control (C2) (ROUTINE only calls) (C2(R)) or non-C2 voice subscribers. The SUT is certified for joint use deployment in a non-ASLAN for C2R and non-C2 traffic. When deployed in a non-ASLAN, the SUT may also be used to receive all levels of precedence, but is limited to supporting calls that are originated at ROUTINE precedence only. Non-ASLANs do not meet the availability or redundancy requirements for C2 or Special C2 users and therefore are not authorized to support precedence calls originated above ROUTINE.

Testing of the SUT did not include video services or data applications; however, simulated preferred data, best effort data, voice, and video traffic was generated during testing to determine the SUT's ability to prioritize and properly queue voice media and signaling traffic. No other

configurations, features, or functions, except those cited within this document, are certified by the JITC. This certification expires upon changes that could affect interoperability, but no later than three years from the date the DISA Field Security Operations (FSO) provided a positive Certification and Accreditation (CA) Recommendation.

3. This finding is based on interoperability testing conducted by JITC, review of the vendor's Letters of Compliance (LoC), and FSO CA Recommendation. Interoperability testing was conducted by JITC at the Global Information Grid Network Test Facility, Fort Huachuca, Arizona, from 21 June through 25 October 2010. Review of the vendor's LoC was completed on 22 June 2010. The FSO provided a positive CA Recommendation on 5 May 2011 based on the security testing completed by DISA-led IA test teams and published in a separate report, Reference (e).

4. Table 1 provides the SUT's interface status. The SUT capability and functional requirements are listed in Table 2.

Table 1. SUT Interface Status

Interface	Applicability Access	CRs/FRs (See note 1.)	Status Access
Network Management Interfaces for Layer 2 Access Switches			
EIA/TIA (Serial) 232	R	EIA/TIA-232	Met
IEEE 802.3i (10BaseT UTP)	C	25-27, 32-36,7-18,25-28, 32-36,44	Met
IEEE 802.3u (100BaseT UTP)	C	25-27, 32-36,7-18,25-28, 32-36,44	Met
IEEE 802.3ab (1000BaseT UTP)	C	25-27, 32-36,7-18,25-28, 32-36,44	Met
Uplink Interfaces for Layer 2 Access Switches			
IEEE 802.3u (100BaseT UTP)	C[2]	7-18, 28, 44	Not Tested[3]
IEEE 802.3u (100BaseFX)	C[2]	10-18, 28, 44	Not Tested[3]
IEEE 802.3ab (1000BaseT UTP)	C[2]	7-18, 28, 44	Met
IEEE 802.3z1000BaseX Fiber	C[2]	10-18, 28, 44	Met
IEEE 802.3ae (10GBaseX)	C[2]	10-18, 28, 44	Met
Access Interfaces for Layer 2 Access Switches			
IEEE 802.3i (10BASET UTP)	C[2]	7-18, 28, 44	Met
IEEE 802.3u (100BaseT UTP)	C[2]	7-18, 28, 44	Not Tested[3]
IEEE 802.3u (100BaseFX)	C[2]	10-18, 28, 44	Not Tested[3]
IEEE 802.3ab (1000BaseT UTP)	C[2]	7-18, 28, 44	Met
IEEE 802.3z (1000BaseX Fiber)	C[2]	10-18, 28, 44	Met
Generic Requirements for all Interfaces			
Generic Requirements not associated with specific interfaces	R	1-6, 19-24, 29-31, 37-47	Met[4]
DoD IPv6 Profile Requirements	R	UCR Section 5.3.5.5 (See note 5.)	Met
Security	R	48-51 (See note 6.)	Met

NOTES:
1 The SUT's specific capability and functional requirement ID numbers depicted in the CRs/FRs column can be cross-referenced in Table 2. These requirements are for the following Cisco® switch models, which are certified in the access layer: Cisco® **Nexus® 5020** and Nexus® 5010. The JITC tested the device that is bolded and underlined. The other device listed that is not bolded or underlined is in the same family series as the SUT were not tested; however, they utilize the same OS software and hardware and JITC analysis determined it to be functionally identical for interoperability certification purposes.
2 Access layer switches are required to support only one of the following IEEE interfaces: 802.3i, 802.3j, 802.3u, 802.3ab and 802.3z.
3 This interface is not offered by the SUT, and is not a required interface.
4 The SUT could not assign any DSCP value to egress traffic. The SUT should not be used in any role where it is required to add or change the DSCP value of Internet Protocol traffic.
5 IPv6 requirements are met by both testing and a vendor letter of compliance.
6 Security testing is accomplished via DISA-led Information Assurance test teams and published in a separate report, Reference (e).

Table 1. SUT Interface Status (continued)

LEGEND:

802.3ab	1000BaseT Gbps Ethernet over twisted pair at 1 Gbps (125 Mbps)	EIA-232	Standard for defining the mechanical and electrical characteristics for connecting Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) data communications devices
802.3ae	10 Gbps Ethernet		
802.3i	10BaseT Mbps over twisted pair		
802.3u	Standard for carrier sense multiple access with collision detection at 100 Mbps	FRs	Functional Requirements
		Gbps	Gigabits per second
802.3z	Gigabit Ethernet Standard	ID	Identification
1000BaseFX	1000 Mbps Ethernet over fiber	IEEE	Institute of Electrical and Electronics Engineers
1000BaseT	1000 Mbps (Baseband Operation, Twisted Pair) Ethernet	IPv6	Internet Protocol version 6
		JITC	Joint Interoperability Test Command
C	Conditional	Mbps	Megabits per second
CRs	Capability Requirements	R	Required
DISA	Defense Information Systems Agency	SUT	System Under Test
DoD	Department of Defense	TIA	Telecommunications Industry Association
DSCP	Differentiated Services Code Point	UCR	Unified Capabilities Requirements
EIA	Electronic Industries Alliance	UTP	Unshielded Twisted Pair

Table 2. SUT Capability and Functional Requirements

ID	Requirement (See note.)		UCR Reference
1	ASLAN components can have no single point of failure for >96 users for C2 and Special C2 users. Non-ASLAN components can have a single point of failure for C2(R) and non-C2 users. (R)		5.3.1.2.1, 5.3.1.7.7
2	Non-blocking of any voice or video traffic at 12.5% for access layer switches. (R)		5.3.1.3
3	Maximum of 1 ms of jitter for voice and 10 ms for video for all ASLAN components. (R) Does not apply to preferred data and best effort data.		5.3.1.3
4	Maximum of .015% packet loss for voice and .05 % for video and preferred data for all ASLAN components. (R) Does not apply to best effort data.		5.3.1.3
5	Maximum of 2 ms latency for voice, 10 ms for video, and 15 ms for preferred data for all ASLAN components. (R) Does not apply to best effort data.		5.3.1.3
6	At least one of the following IEEE interfaces for access layer components: 802.3i, 802.3j, 802.3u, 802.3ab, and 802.3z. (R)		5.3.1.3.1
7	Force mode and auto-negotiation IAW IEEE 802.3, filtering IAW RFC 1812, and flow control IAW IEEE 802.3x. (R)		5.3.1.3.2
8	Port Parameter Requirements	Auto-negotiation IAW IEEE 802.3. (R)	5.3.1.3.2
9		Force mode IAW IEEE 802.3. (R)	
10		Flow control IAW IEEE 802.3x. (R)	
11		Filtering IAW RFC 1812. (R)	
12		Link Aggregation IAW IEEE 802.3ad (output/egress ports only). (R)	
13		Spanning Tree Protocol IAW IEEE 802.1D. (R)	
14		Multiple Spanning Tree IAW IEEE 802.1s. (R)	
15		Rapid Reconfiguration of Spanning Tree IAW IEEE 802.1w. (R)	
16	LACP link Failover and Link Aggregation IAW IEEE 802.3ad (uplink ports only) (R)		5.3.1.3.2, 5.3.1.7.7.1
17	Class of Service Marking: Layer 3 DSCPs IAW RFC 2474. (R) Layer 2 3-bit user priority field of the IEEE 802.1Q 2-byte TCI field. (C)		5.3.1.3.3
18	VLAN Capabilities IAW IEEE 802.1Q. (R)		5.3.1.3.4
19	Protocols IAW DISR profile (IPv4 and IPv6). IPv4 (R: LAN Switch, Layer 2 Switch): IPv6 (R: LAN Switch, C: Layer 2 Switch). Note: Layer 2 switch is required to support only RFC 2460, 5095, 2464, and be able to queue packets based on DSCPs in accordance with RFC 2474.		5.3.1.3.5
20	QoS Features	Shall support minimum of 4 queues. (R)	5.3.1.3.6
21		Must be able to assign VLAN tagged packets to a queue. (R)	
22		Support DSCP PHBs per RFCs 2474, 2597, 2598, and 3246. (R: LAN Switch). Note: Layer 2 switch is required to support RFC 2474 only.	
23		Support a minimum of one of the following: Weighted Fair Queuing (WFQ) IAW RFC 3662, Priority Queuing (PQ) IAW RFC 1046, or Class-Based WFQ IAW RFC 3366. (R)	
24		Must be able to assign a bandwidth or percent of traffic to any queue. (R)	
25	Network Monitoring	SNMP IAW RFC's 1157, 2206, 3410, 3411, 3412, 3413, and 3414. (R)	5.3.1.3.7
26		SNMP traps IAW RFC1215. (R)	
27		Remote monitoring IAW RFC1281 and Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model IAW RFC 3826. (R)	

Table 2. SUT Capability and Functional Requirements (continued)

ID	Requirement (See note.)		UCR Reference
28	Product Requirements Summary IAW UCR 2008, Change 2, Table 5.3.1-5. (R)		5.3.1.3.9
29	E2E Performance (Voice)	No more than 6 ms latency over any 5-minute period measured under 100% congestion. (R)	5.3.1.4.1
		No more than 3 ms jitter over any 5-minute period measured under 100% congestion. (R)	
		Packet loss not to exceed .045% engineered (queuing) parameters over any 5-minute period under 100% congestion. (R)	
30	E2E Performance (Video)	No more than 30 ms latency over any 5-minute period measured under 100% congestion. (R)	5.3.1.4.2
		No more than 30 ms jitter over any 5-minute period measured under 100% congestion. (R)	
		Packet loss not to exceed .15% engineered (queuing) parameters over any 5-minute period under 100% congestion. (R)	
31	E2E Performance (Data)	No more than 45 ms latency over any 5-minute period measured under 100% congestion (R)	5.3.1.4.3
		Packet loss not to exceed .15% engineered (queuing) parameters over any 5-minute period under 100% congestion. (R)	
32	LAN Network Management	Configuration Control for ASLAN and non-ASLAN. (R)	5.3.1.6.1
33		Operational Controls for ASLAN and non-ASLAN. (R)	5.3.1.6.2
34		Performance Monitoring for ASLAN and non-ASLAN. (R)	5.3.1.6.3
35		Alarms for ASLAN and non-ASLAN. (R)	5.3.1.6.4
36		Reporting for ASLAN and non-ASLAN. (R)	5.3.1.6.5
37	Redundancy	Redundant Power Supplies. (Required on standalone redundant products.)	5.3.1.7.7
38		Chassis Failover. (Required on standalone redundant products.)	
39		Switch Fabric Failover. (Required on standalone redundant products.)	
40		Non-LACP Link Failover. (R)	
41		Fiber Blade Failover. (R)	
42		Stack Failover. (C) (Required if the stack supports more than 96 users.)	
43		CPU (routing engine) blade Failover. (R)	
44	Support IPv6 packets over Ethernet IAW RFC2464. (R)		5.3.5.4
45	Site Requirements	Engineering Requirements: Physical Media for ASLAN and non-ASLAN. (R) (Site requirement)	5.3.1.7.1
46		Battery Back up two hours for non-ASLAN components and eight hours for ASLAN components. (R) (Site requirement)	5.3.1.7.5
47		Availability of 99.999 percent (Special C2), and 99.997 percent (C2) for ASLAN (R), and 99.9 percent (non-C2 and C2(R) for non-ASLAN. (R) (Site requirement)	5.3.1.7.6
48	IA Security requirements	Port-Based access Control IAW IEEE 802.1x. (R)	5.3.1.3.2
49		Secure methods for network configuration. SSH2 instead of Telnet and support RFCs 4251-4254. Must use HTTPS instead of http, and support RFCs 2660 and 2818 for ASLAN and non-ASLAN. (R)	5.3.1.6
50		Security (R)	5.3.1.3.8
51		Must meet IA requirements IAW UCR 2008, Change 2, Section 5.4 for ASLAN and non-ASLAN. (R)	5.3.1.5

LEGEND:

ASLAN	Assured Services Local Area Network	HTTPS	Hyper Text Transfer Protocol, Secure	PHB	Per Hop Behavior
C	Conditional	IA	Information Assurance	QoS	Quality of Service
C2	Command and Control	IAW	In Accordance with	R	Required
C2(R)	Command and Control ROUTINE only	ID	Identification	RFC	Request for Comments
CPU	Central Processing Unit	IEEE	Institute of Electrical and Electronics Engineers	SNMP	Simple Network Management Protocol
DISR	Department of Defense Information Technology Standards Registry	IPv4	Internet Protocol version 4	SSH2	Secure Shell Version 2
		IPv6	Internet Protocol version 6	SUT	System Under Test
DSCP	Differentiated Services Code Point	LACP	Link Aggregation Control Protocol	TCI	Tag Control Information
E2E	End-to-End	LAN	Local Area Network	UCR	Unified Capabilities Requirements
HTTP	Hypertext Transfer Protocol	ms	millisecond	VLAN	Virtual Local Area Network

5. No detailed test report was developed in accordance with the Program Manager's request. JITC distributes interoperability information via the JITC Electronic Report Distribution (ERD) system, which uses Unclassified-But-Sensitive Internet Protocol Router Network (NIPRNet) e-mail. More comprehensive interoperability status information is available via the JITC System Tracking Program (STP). The STP is accessible by .mil/gov users on the NIPRNet at https://stp.fhu.disa.mil. Test reports, lessons learned, and related testing documents and

references are on the JITC Joint Interoperability Tool (JIT) at https://jit.fhu.disa.mil (NIPRNet). Information related to DSN testing is on the Telecom Switched Services Interoperability (TSSI) website at http://jitc.fhu.disa.mil/tssi. Due to the sensitivity of the information, the Information Assurance Accreditation Package (IAAP) that contains the approved configuration and deployment guide must be requested directly through government civilian or uniformed military personnel from the Unified Capabilities Certification Office (UCCO), e-mail: ucco@disa.mil.

6. The JITC point of contact is Mr. Edward Mellon, DSN 879-5159, commercial (520) 538-5159, FAX DSN 879-4347, or e-mail to Edward.Mellon@disa.mil. The JITC's mailing address is P.O. Box 12798, Fort Huachuca, AZ 85670-2798. The Tracking Number for the SUT is 1002814.

FOR THE COMMANDER:

2 Enclosures a/s

for BRADLEY A. CLARK
Chief
Battlespace Communications Portfolio

Distribution (electronic mail):
Joint Staff J-6
Joint Interoperability Test Command, Liaison, TE3/JT1
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Department of the Army, Office of the Secretary of the Army, DA-OSA CIO/G-6 ASA (ALT), SAIS-IOQ
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DOT&E, Net-Centric Systems and Naval Warfare
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Defense Intelligence Agency
National Security Agency, DT
Defense Information Systems Agency, TEMC
Office of Assistant Secretary of Defense (NII)/DOD CIO
U.S. Joint Forces Command, Net-Centric Integration, Communication, and Capabilities Division, J68
Defense Information Systems Agency, GS23

ADDITIONAL REFERENCES

(c) Office of the Assistant Secretary of Defense, "Department of Defense Unified Capabilities Requirements 2008 Change 2," 31 December 2010
(d) Joint Interoperability Test Command, "Defense Switched Network Generic Switch Test Plan (GSTP), Change 2," 2 October 2006
(e) Joint Interoperability Test Command, "Information Assurance (IA) Assessment of Cisco Nexus 5000 Nexus Operating System (NxOS) 4.1(3)N2(1a) (Tracking Number 1002814)," Draft

CERTIFICATION TESTING SUMMARY

1. SYSTEM TITLE. Cisco® Nexus® 5000 Series Release Nexus Operating System (NX-OS®) 4.2(1)N1(1); hereinafter referred to as the System Under Test (SUT).

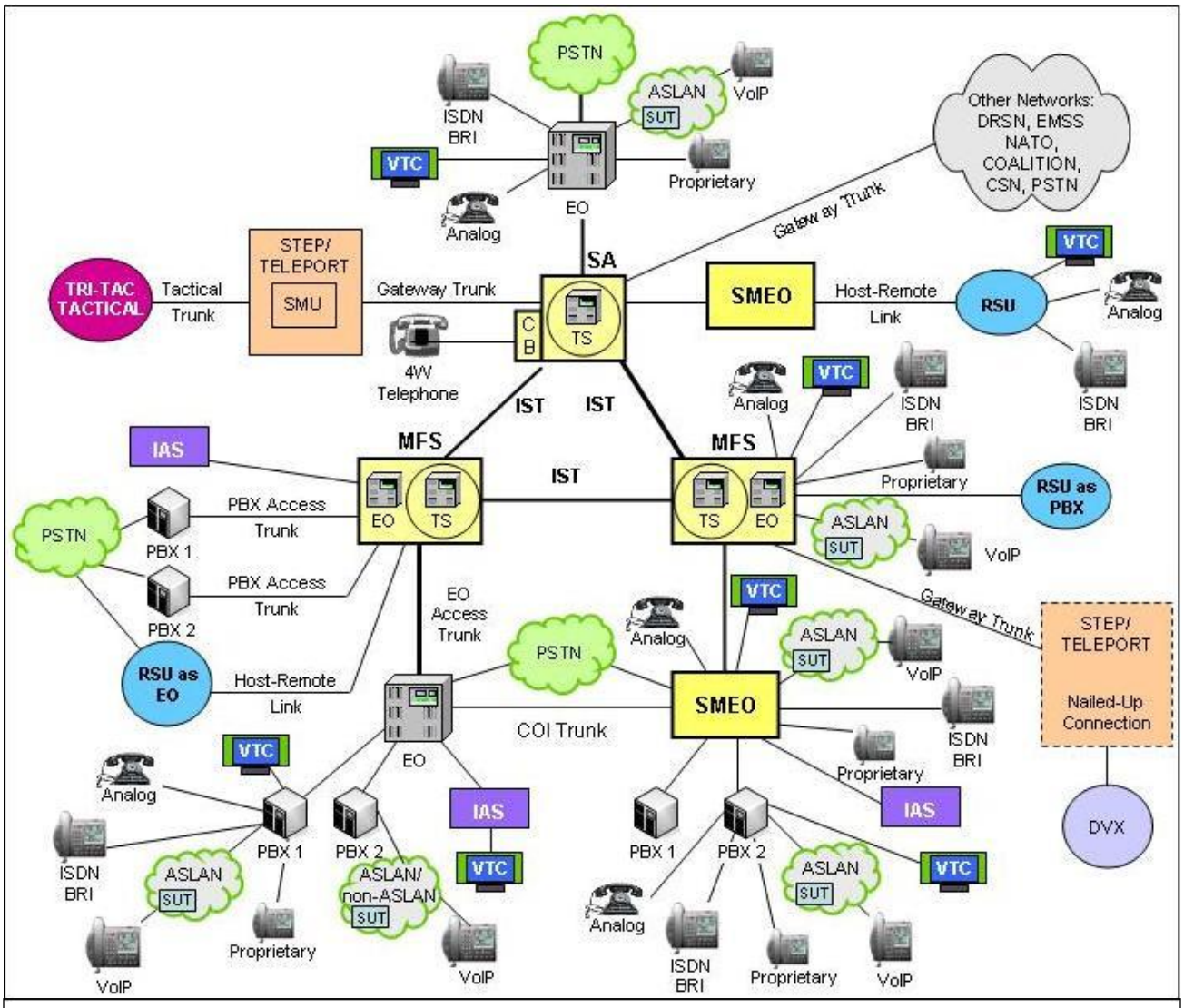
2. PROPONENT. Headquarters United States Army Information Systems Engineering Command (HQUSAISEC).

3. PROGRAM MANAGER. Mr. Jordan Silk, ELIE-ISE-TI, Building 53302, Fort Huachuca, Arizona, 85613-5300, e-mail: jordan.silk@us.army.mil.

4. TESTER. Joint Interoperability Test Command (JITC), Fort Huachuca, Arizona.

5. SYSTEM UNDER TEST DESCRIPTION. The SUT is used to transport voice signaling and media as part of an overall Voice over Internet Protocol (VoIP) system. The SUT provides availability, security, and Quality of Service (QoS) to meet the operational requirements of the network and Assured Services for the warfighter. The SUT is certified as a layer 2 access switch and is interoperable for joint use with other Assured Services Local Area Network ASLAN components listed on the Unified Capabilities (UC) Approved Products List (APL) with the following interfaces: 1000/10000 Base SX/LX and 1000/10000 BaseT. The Cisco® Nexus® 5020 was the system tested; however, the Cisco® Nexus® 5010 employs the same software and similar hardware as the SUT. The JITC analysis determined this system to be functionally identical to the SUT for interoperability certification purposes.

6. OPERATIONAL ARCHITECTURE. The Defense Switched Network (DSN) architecture is a two-level network hierarchy consisting of DSN backbone switches and Service/Agency installation switches. Service/Agency installation switches have been authorized to extend voice services over Internet Protocol (IP) infrastructures. The Unified Capabilities Requirements (UCR) operational DSN Architecture is depicted in Figure 2-1, which depicts the relationship of the ASLAN and non-ASLAN to the DSN switch types.



LEGEND:

4W	4-Wire
ASLAN	Assured Services Local Area Network
BRI	Basic Rate Interface
CB	Channel Bank
COI	Community of Interest
CSN	Canadian Switch Network
DRSN	Defense Red Switch Network
DSN	Defense Switched Network
DVX	Deployable Voice Exchange
EMSS	Enhanced Mobile Satellite System
EO	End Office
IAS	Integrated Access Switch
IP	Internet Protocol
ISDN	Integrated Services Digital Network
IST	Interswitch Trunk
MFS	Multifunction Switch
NATO	North Atlantic Treaty Organization
PBX	Private Branch Exchange
PBX 1	Private Branch Exchange 1
PBX 2	Private Branch Exchange 1
PC	Personal Computer
PSTN	Public Switched Telephone Network
RSU	Remote Switching Unit
SMEO	Small End Office
SMU	Switched Multiplex Unit
STEP	Standardized Tactical Entry Point
TDM/P	Time Division Multiplex/Packetized
Tri-Tac	Tri-Service Tactical Communications Program
TS	Tandem Switch
VoIP	Voice over Internet Protocol
VTC	Video Teleconferencing
SUT	System Under Test

Figure 2-1. DSN Architecture

7. REQUIRED SYSTEM INTERFACES. The SUT capability and functional requirements are listed in Table 2-1. These requirements are derived from the UCR 2008, Change 2, and verified through JITC testing and review of the vendor's Letters of Compliance (LoC).

Table 2-1. SUT Capability and Functional Requirements

ID	Requirement		UCR Reference
1	ASLAN components can have no single point of failure for >96 users for C2 and Special C2 users. Non-ASLAN components can have a single point of failure for C2(R) and non-C2 users. (R)		5.3.1.2.1, 5.3.1.7.7
2	Non-blocking of any voice or video traffic at 12.5% for access layer switches. (R)		5.3.1.3
3	Maximum of 1 ms of jitter for voice and 10 ms for video for all ASLAN components. (R) Does not apply to preferred data and best effort data.		5.3.1.3
4	Maximum of .015% packet loss for voice and .05 % for video and preferred data for all ASLAN components. (R) Does not apply to best effort data.		5.3.1.3
5	Maximum of 2 ms latency for voice, 10 ms for video, and 15 ms for preferred data for all ASLAN components. (R) Does not apply to best effort data.		5.3.1.3
6	At least one of the following IEEE interfaces for access layer components: 802.3i, 802.3j, 802.3u, 802.3ab, and 802.3z. (R)		5.3.1.3.1
7	Force mode and auto-negotiation IAW IEEE 802.3, filtering IAW RFC 1812, and flow control IAW IEEE 802.3x. (R)		5.3.1.3.2
8	Port Parameter Requirements	Auto-negotiation IAW IEEE 802.3. (R)	5.3.1.3.2
9		Force mode IAW IEEE 802.3. (R)	
10		Flow control IAW IEEE 802.3x. (R)	
11		Filtering IAW RFC 1812. (R)	
12		Link Aggregation IAW IEEE 802.3ad (output/egress ports only). (R)	
13		Spanning Tree Protocol IAW IEEE 802.1D. (R)	
14		Multiple Spanning Tree IAW IEEE 802.1s. (R)	
15		Rapid Reconfiguration of Spanning Tree IAW IEEE 802.1w. (R)	
16	LACP link Failover and Link Aggregation IAW IEEE 802.3ad (uplink ports only) (R)		5.3.1.3.2, 5.3.1.7.7.1
17	Class of Service Marking: Layer 3 DSCPs IAW RFC 2474. (R) Layer 2 3-bit user priority field of the IEEE 802.1Q 2-byte TCI field. (C)		5.3.1.3.3
18	VLAN Capabilities IAW IEEE 802.1Q. (R)		5.3.1.3.4
19	Protocols IAW DISR profile (IPv4 and IPv6). IPv4 (R: LAN Switch, Layer 2 Switch): IPv6 (R: LAN Switch, C: Layer 2 Switch). Note: Layer 2 switch is required to support only RFC 2460, 5095, 2464, and be able to queue packets based on DSCPs in accordance with RFC 2474.		5.3.1.3.5
20	QoS Features	Shall support minimum of 4 queues. (R)	5.3.1.3.6
21		Must be able to assign VLAN tagged packets to a queue. (R)	
22		Support DSCP PHBs per RFCs 2474, 2597, 2598, and 3246. (R: LAN Switch). Note: Layer 2 switch is required to support RFC 2474 only.	
23		Support a minimum of one of the following: Weighted Fair Queuing (WFQ) IAW RFC 3662, Priority Queuing (PQ) IAW RFC 1046, or Class-Based WFQ IAW RFC 3366. (R)	
24		Must be able to assign a bandwidth or percent of traffic to any queue. (R)	
25	Network Monitoring	SNMP IAW RFC's 1157, 2206, 3410, 3411, 3412, 3413, and 3414. (R)	5.3.1.3.7
26		SNMP traps IAW RFC1215. (R)	
27		Remote monitoring IAW RFC1281 and Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model IAW RFC 3826. (R)	
28	Product Requirements Summary IAW UCR 2008, Change 2, Table 5.3.1-5. (R)		5.3.1.3.9
29	E2E Performance (Voice)	No more than 6 ms latency over any 5-minute period measured under 100% congestion. (R)	5.3.1.4.1
		No more than 3 ms jitter over any 5-minute period measured under 100% congestion. (R)	
		Packet loss not to exceed .045% engineered (queuing) parameters over any 5-minute period under 100% congestion. (R)	
30	E2E Performance (Video)	No more than 30 ms latency over any 5-minute period measured under 100% congestion. (R)	5.3.1.4.2
		No more than 30 ms jitter over any 5-minute period measured under 100% congestion. (R)	
		Packet loss not to exceed .15% engineered (queuing) parameters over any 5-minute period under 100% congestion. (R)	
31	E2E Performance (Data)	No more than 45 ms latency over any 5-minute period measured under 100% congestion (R)	5.3.1.4.3
		Packet loss not to exceed .15% engineered (queuing) parameters over any 5-minute period under 100% congestion. (R)	

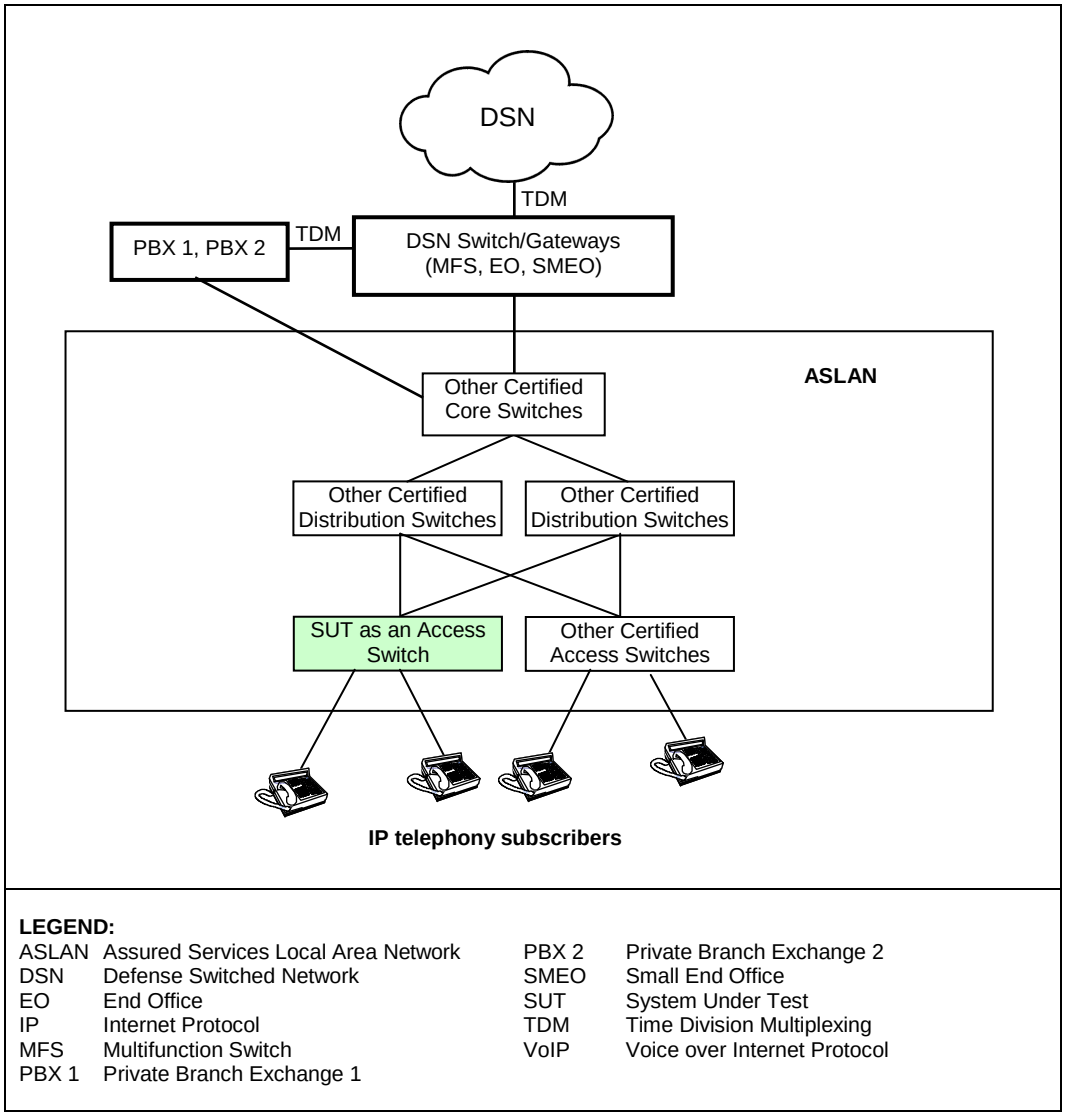
Table 2-1. SUT Capability and Functional Requirements (continued)

ID	Requirement		UCR Reference
32	LAN Network Management	Configuration Control for ASLAN and non-ASLAN. (R)	5.3.1.6.1
33		Operational Controls for ASLAN and non-ASLAN. (R)	5.3.1.6.2
34		Performance Monitoring for ASLAN and non-ASLAN. (R)	5.3.1.6.3
35		Alarms for ASLAN and non-ASLAN. (R)	5.3.1.6.4
36		Reporting for ASLAN and non-ASLAN. (R)	5.3.1.6.5
37	Redundancy	Redundant Power Supplies. (Required on standalone redundant products.)	5.3.1.7.7
38		Chassis Failover. (Required on standalone redundant products.)	
39		Switch Fabric Failover. (Required on standalone redundant products.)	
40		Non-LACP Link Failover. (R)	
41		Fiber Blade Failover. (R)	
42		Stack Failover. (C) (Required if the stack supports more than 96 users.)	
43		CPU (routing engine) blade Failover. (R)	
44	Support IPv6 packets over Ethernet IAW RFC2464. (R)		5.3.5.4
45	Site Requirements	Engineering Requirements: Physical Media for ASLAN and non-ASLAN. (R) (Site requirement)	5.3.1.7.1
46		Battery Back up two hours for non-ASLAN components and eight hours for ASLAN components. (R) (Site requirement)	5.3.1.7.5
47		Availability of 99.999 percent (Special C2), and 99.997 percent (C2) for ASLAN (R), and 99.9 percent (non-C2 and C2(R) for non-ASLAN. (R) (Site requirement)	5.3.1.7.6
48	IA Security requirements	Port-Based access Control IAW IEEE 802.1x. (R)	5.3.1.3.2
49		Secure methods for network configuration. SSH2 instead of Telnet and support RFCs 4251-4254. Must use HTTPS instead of http, and support RFCs 2660 and 2818 for ASLAN and non-ASLAN. (R)	5.3.1.6
50		Security (R)	5.3.1.3.8
51		Must meet IA requirements IAW UCR 2008, Change 2, Section 5.4 for ASLAN and non-ASLAN. (R)	5.3.1.5

LEGEND:

ASLAN	Assured Services Local Area Network	HTTP	Hypertext Transfer Protocol	ms	millisecond
C	Conditional	HTTPS	Hyper Text Transfer Protocol, Secure	PHB	Per Hop Behavior
C2	Command and Control	IA	Information Assurance	QoS	Quality of Service
C2(R)	Command and Control ROUTINE only	IAW	In Accordance with	R	Required
CPU	Central Processing Unit	ID	Identification	RFC	Request for Comments
DISR	Department of Defense Information Technology Standards Registry	IEEE	Institute of Electrical and Electronics Engineers	SNMP	Simple Network Management Protocol
DSCP	Differentiated Services Code Point	IPv4	Internet Protocol version 4	SSH2	Secure Shell Version 2
E2E	End-to-End	IPv6	Internet Protocol version 6	SUT	System Under Test
		LACP	Link Aggregation Control Protocol	TCI	Tag Control Information
		LAN	Local Area Network	UCR	Unified Capabilities Requirements
				VLAN	Virtual Local Area Network

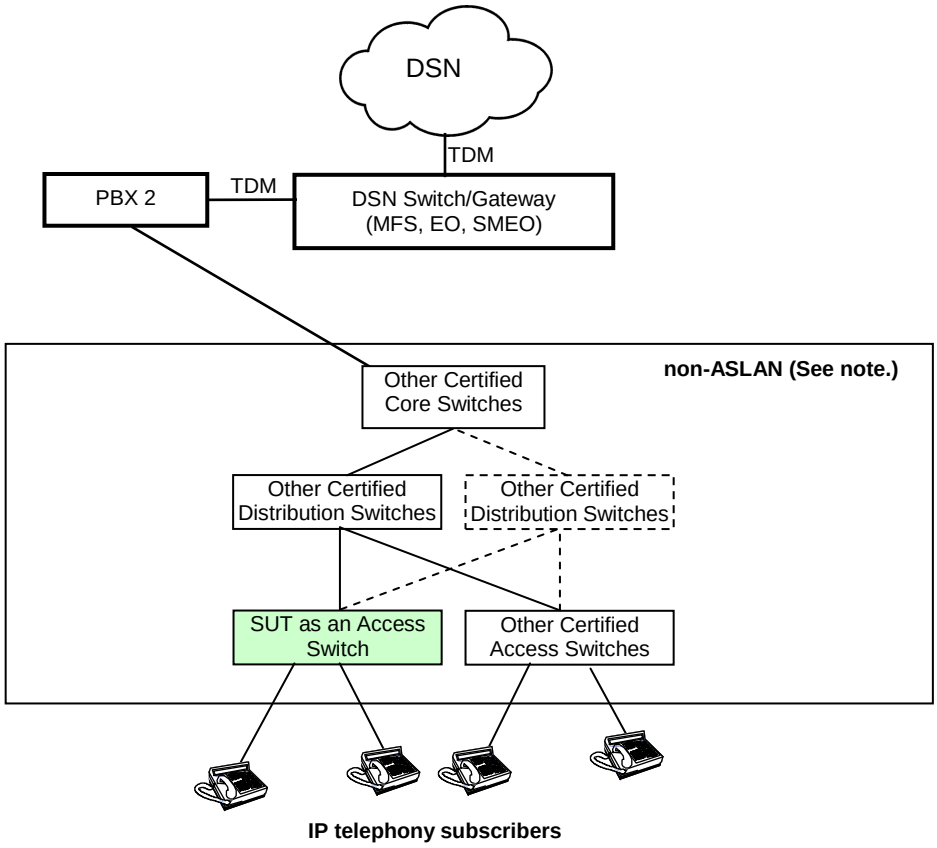
8. TEST NETWORK DESCRIPTION. The SUT was tested at JITC's Global Information Grid Network Test Facility in a manner and configuration similar to that of the DSN operational environment. A notional diagram of the SUT within an ASLAN VoIP architecture is depicted in Figure 2-2 and the notional non-ASLAN VoIP architecture is depicted in Figure 2-3. The notional ASLAN and non-ASLAN combined VoIP architecture is depicted in Figure 2-4. The ASLAN test configuration used to test the SUT in a homogeneous network is depicted in Figure 2-5, and the heterogeneous test network configurations are depicted in Figures 2-6 and 2-7.



LEGEND:

ASLAN	Assured Services Local Area Network	PBX 2	Private Branch Exchange 2
DSN	Defense Switched Network	SMEO	Small End Office
EO	End Office	SUT	System Under Test
IP	Internet Protocol	TDM	Time Division Multiplexing
MFS	Multifunction Switch	VoIP	Voice over Internet Protocol
PBX 1	Private Branch Exchange 1		

Figure 2-2. SUT Notional ASLAN VoIP Architecture

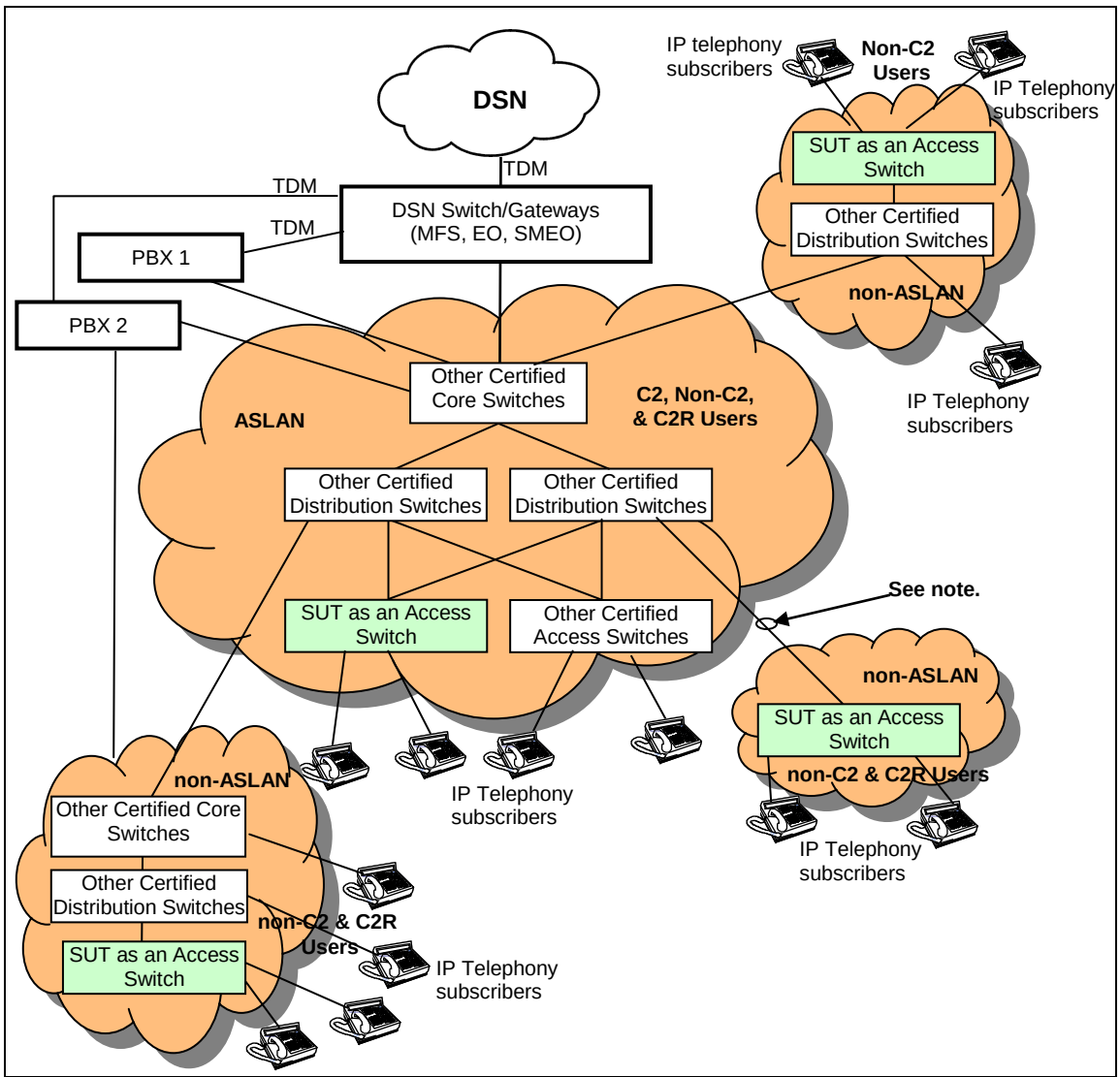


NOTE: Dotted lines denote optional links/components not required for a non-ASLAN. A single point of failure, which could impact more than 96 telephony subscribers, is permitted and switch modularity is not required.

LEGEND:

ASLAN	Assured Services Local Area Network	PBX 2	Private Branch Exchange 2
DSN	Defense Switched Network	SMEO	Small End Office
EO	End Office	SUT	System Under Test
IP	Internet Protocol	TDM	Time Division Multiplexing
MFS	Multifunction Switch	VoIP	Voice over Internet Protocol
PBX 1	Private Branch Exchange 1		

Figure 2-3. SUT Notional Non-ASLAN VoIP Architecture

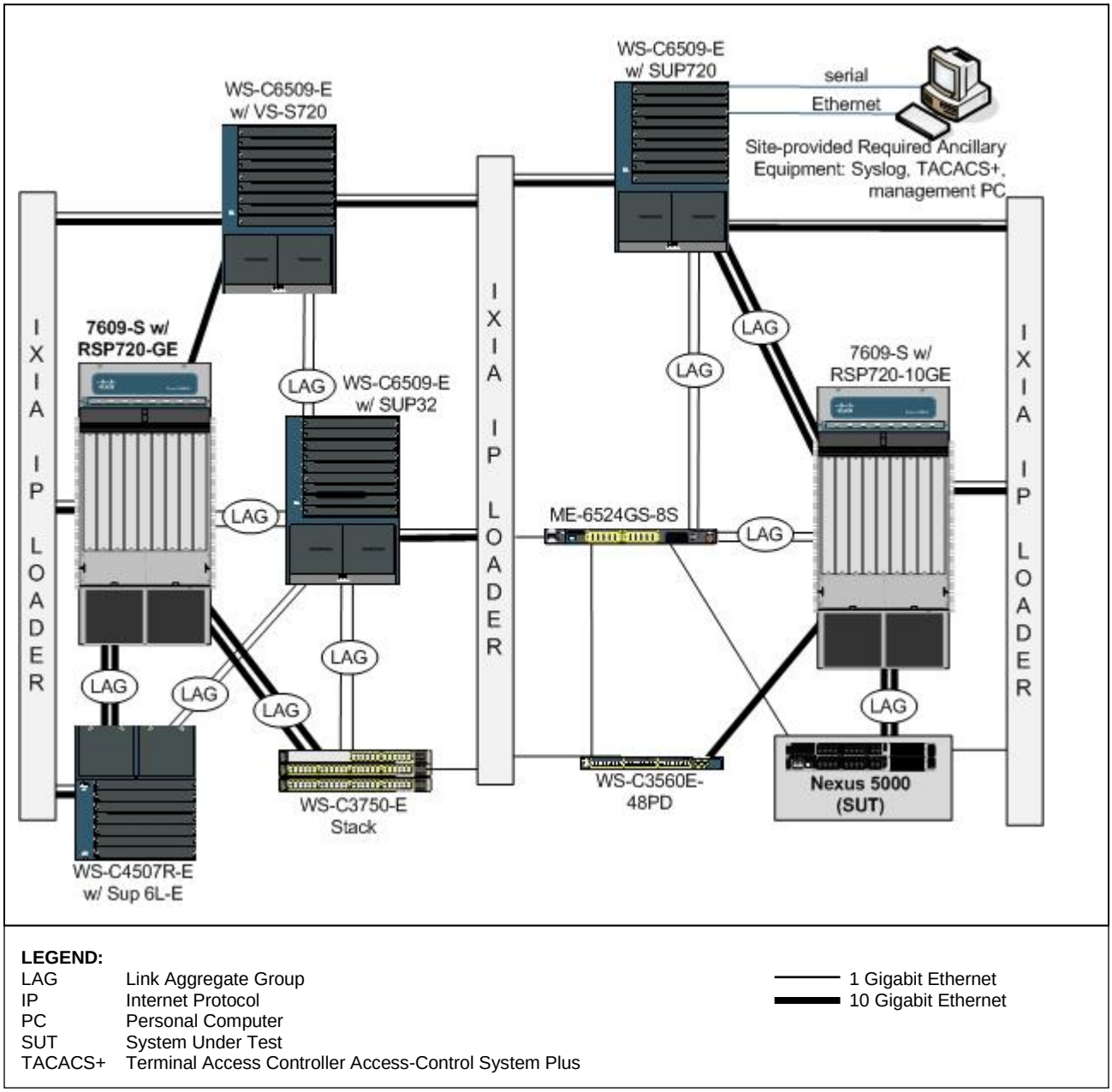


NOTE: A non-ASLAN switch can connect to an ASLAN switch at any layer provided that the connection does not cause the ASLAN to exceed the traffic engineering limits. A single point of failure, which could impact more than 96 telephony subscribers, is permitted and switch modularity is not required.

LEGEND:

ASLAN	Assured Services Local Area Network	PBX 1	Private Branch Exchange 1
C2	Command and Control	PBX 2	Private Branch Exchange 2
C2R	Command and Control ROUTINE Only	SMEO	Small End Office
DSN	Defense Switched Network	SUT	System Under Test
EO	End Office	TDM	Time Division Multiplexing
IP	Internet Protocol	VoIP	Voice over Internet Protocol
MFS	Multifunction Switch		

Figure 2-4. SUT Notional ASLAN and non-ASLAN Combined VoIP Architecture

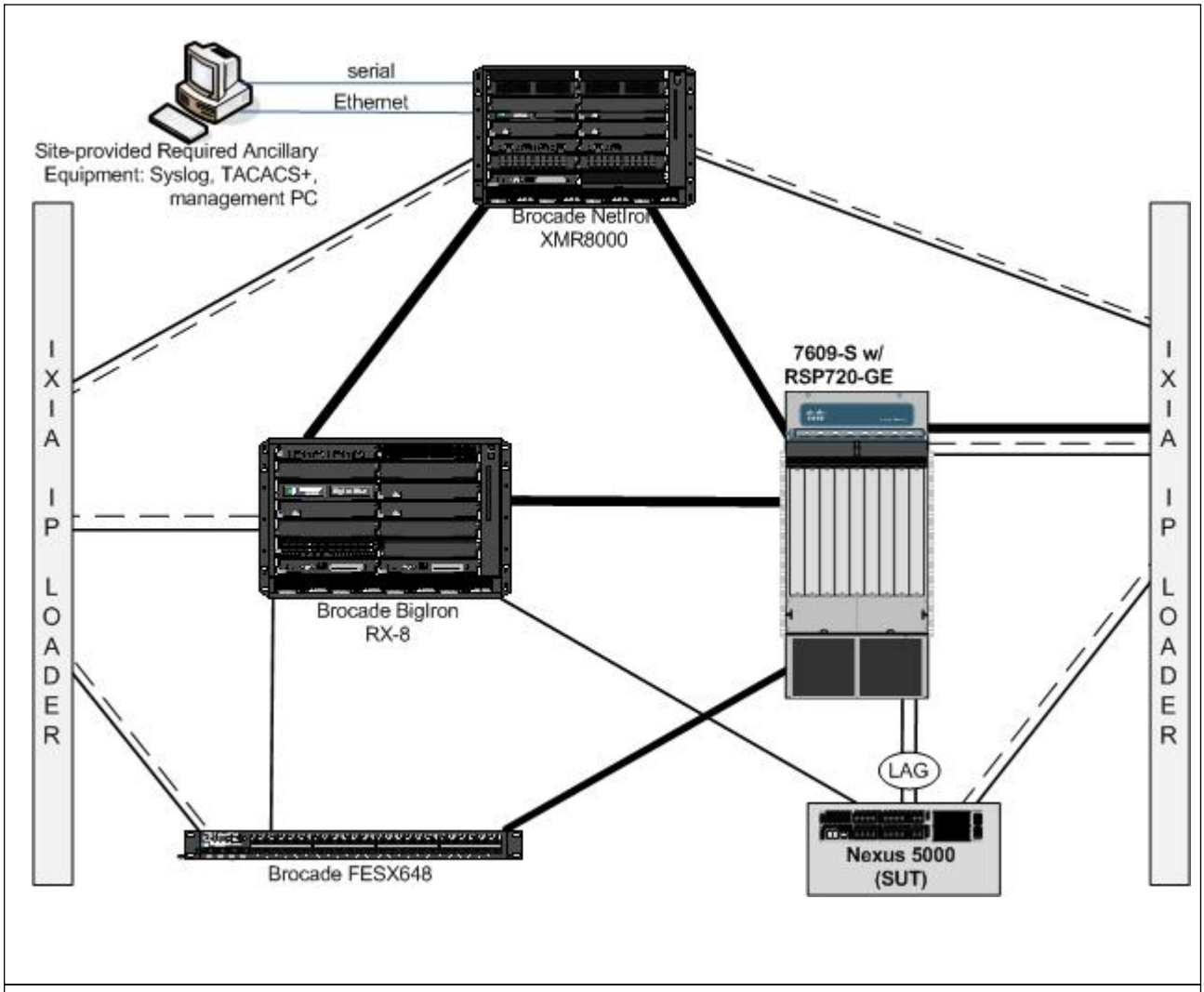


LEGEND:

LAG	Link Aggregate Group
IP	Internet Protocol
PC	Personal Computer
SUT	System Under Test
TACACS+	Terminal Access Controller Access-Control System Plus

1 Gigabit Ethernet
10 Gigabit Ethernet

Figure 2-5. SUT Homogenous Test Configuration

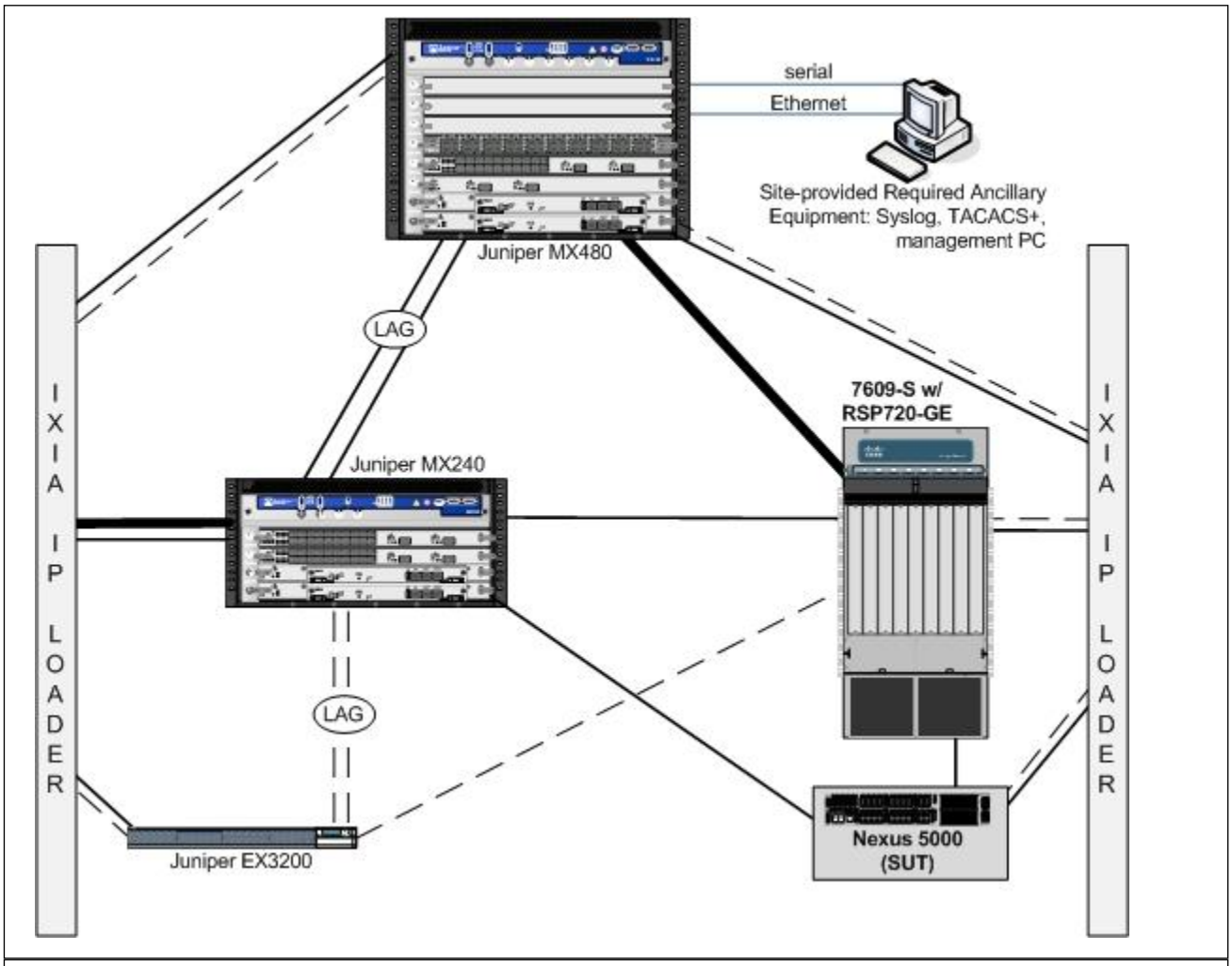


LEGEND:

LAG	Link Aggregate Group
IP	Internet Protocol
PC	Personal Computer
POE	Power over Ethernet
SUT	System Under Test
TACACS+	Terminal Access Controller Access-Control System Plus

- – – – Fast Ethernet
- ——— 1 Gigabit Ethernet
- ▬▬▬ 10 Gigabit Ethernet

Figure 2-6. SUT Heterogeneous Test Configuration with Brocade



LEGEND:

LAG	Link Aggregate Group
IP	Internet Protocol
PC	Personal Computer
SUT	System Under Test
TACACS+	Terminal Access Controller Access-Control System Plus

- – – – Fast Ethernet
- ——— 1 Gigabit Ethernet
- ——— 10 Gigabit Ethernet

Figure 2-7. SUT Heterogeneous Test Configuration with Juniper

9. SYSTEM CONFIGURATIONS. Table 2-2 provides the system configurations, hardware, and software components tested with the SUT. The SUT is certified with other IP systems listed on the UC APL that are certified for use with an ASLAN or non-ASLAN.

Table 2-2. Tested System Configuration

System Name	Release
Cisco® WS-6509-E	IOS® 12.2(33)SX14
Cisco® 7609-S	IOS® 12.2(33)SRE2
Cisco® WS-C4507R-E	IOS® 12.2(53)SG2
Cisco® WS-C3750-E	IOS® 12.2(53)SE2
Cisco® WS-C3560E-48PD	IOS® 12.2(53)SE2
Cisco® ME-6524GS-8S	IOS® 12.2(33)SX14
Brocade NetIron XMR8000	V4.0.0ft163
Brocade BigIron RX-8	V2.7.2aT143
Brocade FastIron FESX648	7.2.01
Juniper MX480	9.3R4.4
Juniper MX240	9.3R4.4
Juniper EX3200	9.3r2.8

SUT Component (See note.)	Release	Function	Sub-component (See note.)	Description
Cisco® **NFK-C5020P-BF** and N5K-C5010P-BF	NXOS 4.2(1)N1(1)	Access (Layer 2)	**N5K-M1600**	Cisco Nexus 5000 1000 Series Module 6-port 10 Gigabit Ethernet (SFP+)
			N5K-M1404	Cisco Nexus 5000 1000 Series Module 4x10GE, 4xFC 4/2/1 (SFP+, SFP)

NOTE: Components bolded and underlined were tested by JITC. The other components in the family series were not tested; however, they utilize the same software and hardware and JITC analysis determined them to be functionally identical for interoperability certification purposes and they are also certified for joint use.

LEGEND:
JITC Joint Interoperability Test Command
SFP Small Form Factor Pluggable
SUT System Under Test

10. TESTING LIMITATIONS. None.

11. TEST RESULTS

a. Discussion. The SUT is certified to support Assured Services within an ASLAN. If a component meets the minimum requirements for deployment in an ASLAN, it also meets the lesser requirements for deployment in a non-ASLAN. Non-ASLANs are “commercial grade” and provide support to Command and Control (C2) (ROUTINE only calls) (C2(R)) or non-C2 voice subscribers. The SUT is certified for joint use deployment in a non-ASLAN for C2R and non-C2 traffic. When deployed in a non-ASLAN, the SUT may also be used to receive all levels of precedence, but are limited to originating ROUTINE precedence only. Non-ASLANs do not need to meet the availability or redundancy requirements of the C2 or Special C2 users and they are not authorized as subscribers on a non-ASLAN.

b. Test Conduct. The SUT was tested as a layer 2 access switch in both homogeneous and heterogeneous ASLAN configurations and met all of the requirements with testing and/or the vendor's LoC as outlined in the sub paragraphs below.

(1) The UCR 2008, Change 2, paragraphs 5.3.1.2.1, 5.3.1.7.7, 5.3.1.7.7.1, 5.3.1.7.7.2, state that ASLAN components can have no single point of failure for more than 96 users for C2 and Special C2 users. The UCR 2008, Change 2, paragraph 5.3.1.7.7, states the following Redundancy requirements. Redundancy can be met if the product itself provides redundancy internally or a secondary product is added to the ASLAN to provide redundancy to the primary product. Single-product redundancy may be met with a modular chassis that at a minimum provides the following: dual power supplies, dual processers, termination sparing, redundancy protocol, no single point of failure, and switch fabric or backplane redundancy. In the event of a component failure in the network, all calls that are active shall not be disrupted (loss of existing connection requiring redialing) and the path through the network shall be restored within five seconds. If a secondary product has been added to provide redundancy to a primary product, the failover to the secondary product must not result in any lost calls. In the event of a primary product failure, all calls that are active shall not be disrupted and the failover to the secondary product must be restored within five seconds. Non-ASLAN components can have a single point of failure for C2(R) and non-C2 users. The SUT met all of these requirements. The SUT was equipped with redundant uplinks and power supplies. All of the redundant components were tested and found to meet all the failover and access requirements with a measured restoral within 2.0 seconds with no loss of existing active circuits.

(2) The UCR 2008, Change 2, paragraph 5.3.1.3, states that the ASLAN infrastructure components shall meet the requirements in the subparagraphs below. The SUT was tested using 110 percent oversubscription of the total aggregate uplink bandwidth for 10 Gbps. This included 35 percent of uplink aggregate in untagged best effort data, and 75 percent of uplink aggregate in tagged Internet Protocol version 4 (IPv4) and Internet Protocol version 6 (IPv6) voice, video, and preferred data traffic.

(a) The SUT shall be non-blocking for a minimum of 12.5 percent (maximum voice and video traffic) of its maximum rated output capacity for egress ports that interconnect (trunk) the product to other products. Non-blocking is defined as the capability to send and receive 64 to 1518 byte packets at full duplex rates from ingress ports to egress ports without losing any packets. The SUT met this requirement by insuring that higher priority tagged traffic was queued above lower priority tagged traffic and untagged best effort data.

(b) The SUT shall have the capability to transport prioritized voice packets (media and signaling) with no more than 1 millisecond (ms) jitter across all switches. All ASLAN infrastructure components shall have the capability to transport prioritized video packets (media and signaling) with no more than 10 ms jitter across all switches. The

jitter shall be achievable over any five-minute period measured from ingress ports to egress ports under congested conditions. The SUT met this requirement with a measured jitter of less than 1 ms for voice and video packets.

(c) All access products shall have the capability to transport prioritized voice and video packets (media and signaling) with no more than .015 percent packet loss and .05 packet loss for video (media and signaling), best effort and preferred data. The packet loss shall be achievable over any five-minute period measured from ingress ports to egress ports under congested conditions. The SUT met this requirement with a measured packet loss of 0.00 percent for voice and video packets.

(d) The SUT shall have the capability to transport prioritized voice packets (media and signaling), with no more than 2 ms latency. All ASLAN infrastructure components shall have the capability to transport prioritized video packets (media and signaling), with no more than 10 ms latency and 15 ms for best effort and preferred data. The latency shall be achievable over any five-minute period measured from ingress ports to egress ports under congested conditions. The SUT met this requirement with measured latency average of less than 1 ms of latency for voice and video packets.

(3) The UCR 2008, Change 2, paragraph 5.3.1.3.1, states that, at a minimum, access products shall provide one of the following interface rates and other rates may be provided as conditional interfaces: 10 Mbps in accordance with IEEE 802.3i, 100 Mbps in accordance with IEEE 802.3u, 1000 Mbps in accordance with IEEE 802.ab and IEEE 802.3z. Refer to Table 2-3 for a detailed list of interfaces that were tested. The SUT met these requirements.

Table 2-3. SUT Interface Status

Interface	Applicability	CRs/FRs (See note 1.)	Status
	Access		Access
Network Management Interfaces for Layer 2 Access Switches			
EIA/TIA (Serial) 232	R	EIA/TIA-232	Met
IEEE 802.3i (10BaseT UTP)	C	25-27, 32-36,7-18,25-28, 32-36,44	Met
IEEE 802.3u (100BaseT UTP)	C	25-27, 32-36,7-18,25-28, 32-36,44	Met
IEEE 802.3ab (1000BaseT UTP)	C	25-27, 32-36,7-18,25-28, 32-36,44	Met
Uplink Interfaces for Layer 2 Access Switches			
IEEE 802.3u (100BaseT UTP)	C[2]	7-18, 28, 44	Not Tested[3]
IEEE 802.3u (100BaseFX)	C[2]	10-18, 28, 44	Not Tested[3]
IEEE 802.3ab (1000BaseT UTP)	C[2]	7-18, 28, 44	Met
IEEE 802.3z1000BaseX Fiber	C[2]	10-18, 28, 44	Met
IEEE 802.3ae (10GBaseX)	C[2]	10-18, 28, 44	Met
Access Interfaces for Layer 2 Access Switches			
IEEE 802.3i (10BASET UTP)	C[2]	7-18, 28, 44	Met
IEEE 802.3u (100BaseT UTP)	C[2]	7-18, 28, 44	Not Tested[3]
IEEE 802.3u (100BaseFX)	C[2]	10-18, 28, 44	Not Tested[3]
IEEE 802.3ab (1000BaseT UTP)	C[2]	7-18, 28, 44	Met
IEEE 802.3z (1000BaseX Fiber)	C[2]	10-18, 28, 44	Met

Table 2-3. SUT Interface Status (continued)

Generic Requirements for all Interfaces			
Generic Requirements not associated with specific interfaces	R	1-6, 19-24, 29-31, 37-47	Met[4]
DoD IPv6 Profile Requirements	R	UCR Section 5.3.5.5 (See note 5.)	Met
Security	R	48-51 (See note 6.)	Met

NOTES:
1 The SUT's specific capability and functional requirement ID numbers depicted in the CRs/FRs column can be cross-referenced in Table 2. These requirements are for the following Cisco® switch models, which are certified in the access layer: Cisco® **Nexus® 5020** and Nexus® 5010. The JITC tested the device that is bolded and underlined. The other device listed that is not bolded or underlined is in the same family series as the SUT were not tested; however, they utilize the same OS software and hardware and JITC analysis determined it to be functionally identical for interoperability certification purposes.
2 Access layer switches are required to support only one of the following IEEE interfaces: 802.3i, 802.3j, 802.3u, 802.3ab and 802.3z.
3 This interface is not offered by the SUT, and is not a required interface.
4 The SUT could not assign any DSCP value to egress traffic. The SUT should not be used in any role where it is required to add or change the DSCP value of Internet Protocol traffic.
5 IPv6 requirements are met by both testing and a vendor letter of compliance.
6 Security testing is accomplished via DISA-led Information Assurance test teams and published in a separate report, Reference (e).

LEGEND:

802.3ab	1000BaseT Gbps Ethernet over twisted pair at 1 Gbps (125 Mbps)	EIA-232	Standard for defining the mechanical and electrical characteristics for connecting Data Terminal Equipment (DTE) and Data Circuit-terminating Equipment (DCE) data communications devices
802.3ae	10 Gbps Ethernet		
802.3i	10BaseT Mbps over twisted pair		
802.3u	Standard for carrier sense multiple access with collision detection at 100 Mbps	FRs	Functional Requirements
		Gbps	Gigabits per second
		ID	Identification
802.3z	Gigabit Ethernet Standard	IEEE	Institute of Electrical and Electronics Engineers
1000BaseFX	1000 Mbps Ethernet over fiber	IPv6	Internet Protocol version 6
1000BaseT	1000 Mbps (Baseband Operation, Twisted Pair) Ethernet	JITC	Joint Interoperability Test Command
		Mbps	Megabits per second
C	Conditional	R	Required
CRs	Capability Requirements	SUT	System Under Test
DISA	Defense Information Systems Agency	TIA	Telecommunications Industry Association
DoD	Department of Defense	UCR	Unified Capabilities Requirements
DSCP	Differentiated Services Code Point	UTP	Unshielded Twisted Pair
EIA	Electronic Industries Alliance		

(4) The UCR 2008, Change 2, paragraph 5.3.1.3.2, states that the ASLAN infrastructure components shall provide the following parameters on a per port basis: auto-negotiation, force mode, flow control, filtering, link aggregation, spanning tree protocol, multiple spanning tree, rapid reconfiguration of spanning tree, and port-based access control. The SUT was tested with a series of forced port speeds as well as auto-negotiation. Link failover testing was performed which confirmed spanning tree convergence. All these requirements were met by the SUT with both testing and vendors LoC.

(5) The UCR 2008, Change 2, paragraph 5.3.1.3.3, states that the ASLAN infrastructure components shall support Differentiated Services Code Points (DSCP) in accordance with Request for Comment (RFC) 2474 as stated in the subparagraphs below:

(a) The ASLAN infrastructure components shall be capable of accepting any packet tagged with a DSCP value (0-63) on an ingress port and assign that packet to a QoS behavior listed in Section 5.3.1.3.6. The SUT prioritized the following traffic for queuing from lowest to highest with distinct IPv4 DSCP tags using an IP loader: Data best effort, preferred data, video media and signaling, and voice media and signaling. The IP load included a data best effort load of 35 percent line rate and the other traffic at 75 percent of line rate (25 percent of video signaling, voice signaling, and voice media in the highest priority queue, and 25 percent of video media in the next lower priority queue, and 25 percent of preferred data in the lowest priority queue). The IP loader recorded that the higher prioritized traffic was properly queued by the SUT above lower prioritized best effort traffic.

(b) The ASLAN infrastructure components shall be capable of accepting any packet tagged with a DSCP value (0-63) on an ingress port and reassign that packet to any new DSCP value (0-63). UCR 2008, Change 2, paragraph 5.3.3.3.2. It was determined the SUT could not assign any DSCP value to egress traffic. In accordance with this determination, the SUT should not be used in any role where it is required to add or change the DSCP value of IP traffic.

(c) The ASLAN infrastructure components must be able to support the prioritization of aggregate service classes with queuing according to UCR 2008, Change 2, paragraph 5.3.1.3.6. The SUT prioritized the following traffic for queuing from lowest to highest with distinct IPv6 service class tags using an IP loader: Data best effort, preferred data, video media and signaling, and voice media and signaling. The IP load included a data best effort load of 100 percent line rate and the other traffic at 55 percent of line rate (25 percent of video signaling, voice signaling, and voice media in the highest priority queue, and 25 percent of video media in the next lower priority queue, and 5 percent of preferred data in the lowest priority queue). The IP loader recorded that the higher prioritized traffic was properly queued by the SUT above lower prioritized best effort traffic. It was determined the SUT could not assign any DSCP value to egress traffic. In accordance with this determination, the SUT should not be used in any role where it is required to add or change the DSCP value of IP traffic.

(d) The ASLAN infrastructure components may support the 3-bit user priority field of the IEEE 802.1Q 2-byte Tag Control Information (TCI) field. Default values are provided in UCR 2008, Change 2, Table 5.3.1-4. If provided, the following Class of Service (CoS) requirements apply: The ASLAN infrastructure components shall be capable of accepting any frame tagged with a user priority value (0-7) on an ingress port and assign that frame to a QoS behavior listed in UCR 2008, Change 2, paragraph 5.3.1.3.6. The ASLAN infrastructure components shall be capable of accepting any frame tagged with a user priority value (0-7) on an ingress port and reassign that frame to any new user priority value (0-7). The SUT met this requirement with the vendor's LoC.

(6) The UCR 2008, Change 2, paragraph 5.3.1.3.4, states that the ASLAN infrastructure components shall be capable of the Virtual LAN (VLAN) capabilities in accordance with IEEE 802.1Q. The SUT was configured with a preset VLAN ID tag using the IP loader. This load was captured at the egress and ingress to insure that the SUT was properly assigning the VLAN ID in the proper VLAN and not modifying or misplacing the assigned VLAN traffic in any way. In addition, the SUT has the ability to assign any VLAN ID any value from 0 through 4096. The SUT met this requirement with both testing and vendor's LoC.

(7) The UCR 2008, Change 2, paragraph 5.3.1.3.5, states that the ASLAN infrastructure components shall meet the Department of Defense Information Technology Standards Registry (DISR) protocol requirements for IPv4 and IPv6. The SUT prioritized the following traffic for queuing from lowest to highest with distinct IPv4 DSCP tags and IPv6 service class tags using an IP loader: Data best effort, preferred data, video media and signaling, and voice media and signaling. The IP load included a data best effort load of 35 percent line rate and the other traffic at 75 percent of line rate (25 percent of video signaling, voice signaling, and voice media in the highest priority queue, and 25 percent of video media in the next lower priority queue, and 25 percent of preferred data in the lowest priority queue). The IP loader recorded that the higher prioritized traffic was properly queued by the SUT above lower prioritized best effort traffic. It was verified that the SUT can assign any IPv4 DSCP or IPv6 traffic class value from 0-63 for each type of traffic, which met this requirement. The IPv6 RFC DISR profile requirements were also met with the vendor's LoC. It was determined the SUT could not assign any DSCP value to egress traffic. In accordance with this determination, the SUT should not be used in any role where it is required to add or change the DSCP value of IP traffic

(8) The UCR 2008, Change 2, paragraph 5.3.1.3.6, states that the ASLAN infrastructure components shall be capable of providing the following QoS features:

(a) Provide a minimum of four queues. The SUT has the ability to support more assignable queues; however, only a four-queue model was tested and is covered under this certification.

(b) Assign a DSCP or Traffic Class value to any of the queues. The SUT met this requirement with both testing and vendor's LoC.

(c) Support Differentiated Services (DiffServ) per hop behaviors (PHBs) in accordance with RFCs 2472, 2597, 2598, and 3246. The SUT met this requirement with both testing and vendor's LoC.

(d) Support, at a minimum, one of the following: Weighted Fair Queuing (WFQ) in accordance with RFC 3662, Priority Queuing (PQ) in accordance with RFC 1046, or Class-Based WFQ in accordance with RFC 3366. The SUT supports all three

types of queuing. WFQ and PQ queuing types were met through testing and Class-Based WFQ was met with the vendor's LoC.

(e) All queues shall be capable of having bandwidth assigned or percentage of traffic. The SUT prioritized the following traffic for queuing from lowest to highest with distinct IPv4 DSCP tags and IPv6 service class tags using an IP loader: Data best effort, preferred data, video media and signaling, and voice media and signaling. The IP load included a data best effort load of 35 percent line rate and the other traffic at 75 percent of line rate (25 percent of video signaling, voice signaling, and voice media in the highest priority queue, and 25 percent of video media in the next lower priority queue, and 25 percent of preferred data in the lowest priority queue). The IP loader recorded that the higher prioritized traffic was properly queued by the SUT above lower prioritized best effort traffic at the assigned bandwidth per queue. Subsequently, the IP loader was reconfigured to increase the video traffic to 35 percent of line rate to ensure the SUT only allowed 25 percent throughput of the video traffic. The captured video throughput measured by the IP loader was 25.1 percent of the line rate, which met this requirement. In addition to testing, this requirement was met with the vendor's LoC.

(9) The UCR 2008, Change 2, paragraph 5.3.1.3.7, states that the ASLAN infrastructure components shall be capable of providing the following Network Monitoring features:

(a) Simple Network Management Protocol (SNMP) in accordance with RFCs 1157, 2206, 3410, 3411, 3412, 3413, and 3414. Testing of this requirement was met using an SNMP management tool, which was used to verify SNMP SETS, GETS, and TRAPS. In addition, the SUT met this requirement with the vendor's LoC.

(b) SNMP Traps in accordance with RFC 1215. The SUT met this requirement with both testing and vendor's LoC.

(c) Remote Monitoring (RMON) in accordance with RFC 2819. The SUT met this requirement with the vendor's LoC.

(d) Coexistence between Version 1, Version 2, and Version 3 of the Internet-standard Network Management Framework in accordance with RFC 3584. The SUT met this requirement with the vendor's LoC.

(e) The Advanced Encryption Standard (AES) Cipher Algorithm in the SNMP User-based Security Model in accordance with RFC 3826. Security is tested by DISA-led Information Assurance test teams and published in a separate report, Reference (e).

(10) The UCR 2008, Change 2, paragraph 5.3.1.3.9, states that all switches meet Product Requirements in accordance with UCR 2008, Change 2, Table 5.3.1-5.

The SUT met these requirements listed in Table 5.3.1-5 as stipulated throughout this document by testing and/or vendor LoC.

(11) The UCR 2008, Change 2, section 5.3.1.4, states that the ASLAN infrastructure components shall be capable of meeting the End-to-End (E2E) performance requirements for voice, video, and data services. The E2E performance across a LAN is measured from the traffic ingress point to the traffic egress port. The requirements are measured over any five-minute period under congested conditions. Congested condition is defined as 100 percent of link capacities (as defined by baseline traffic engineering (25 percent voice/signaling, 25 percent video, 25 percent preferred data, and 25 percent best effort traffic). The E2E requirements are ASLAN requirements. However, all of the E2E voice, video, and data services performance requirements were met by the SUT when included within an ASLAN. Refer to paragraphs 11.b.(2)(b), 11.b.(2)(c), and 11.b.(2)(d).

(12) The UCR 2008, Change 2, section 5.3.1.6, states that LAN infrastructure components must meet the requirements in the subparagraphs below. Near Real Time (NRT) is defined as within five seconds of detecting the event, excluding transport time.

(a) LANs shall have the ability to perform remote network product configuration/reconfiguration of objects that have existing DoD GIG management capabilities. The NMS shall report configuration change events in NRT, whether or not the change was authorized. The system shall report the success or failure of authorized configuration change attempts in NRT. The SUT met this requirement by writing to the syslog server in NRT of less than one second.

(b) LAN infrastructure components must provide metrics to the NMS to allow them to make decisions on managing the network. Network management systems shall have an automated NM capability to obtain the status of networks and associated assets in NRT 99 percent of the time (with 99.9 percent as an Objective Requirement). Specific metrics are defined in UCR 2008, Change 2, Sections 5.3.2.17 and 5.3.2.18. The SUT met this requirement by writing to the syslog server in NRT of less than 1 second 100 percent of the time.

(c) LAN components shall be capable of providing status changes 99 percent of the time (with 99.9 percent as an Objective Requirement) by means of an automated capability in NRT. An NMS will have an automated NM capability to obtain the status of networks and associated assets 99 percent of the time (with 99.9 percent as an Objective Requirement) in NRT. The NMS shall collect statistics and monitor bandwidth utilization, delay, jitter, and packet loss. The SUT met this requirement by responding in NRT of less than 1 second 100 percent of the time.

(d) LAN components shall be capable of providing SNMP alarm indications to an NMS. The NMSs will have the NM capability to perform automated fault management of the network, to include problem detection, fault correction, fault isolation and diagnosis, problem tracking until corrective actions are completed, and

historical archiving. Alarms will be correlated to eliminate those that are duplicate or false, initiate test, and perform diagnostics to isolate faults to a replaceable component. Alarms shall be reported as TRAPs via SNMP in NRT. More than 99.95 percent of alarms shall be reported in NRT. The SUT met this requirement by responding in NRT of less than 1 second 100 percent of the time using an over the counter SNMP tool.

(e) An NMS will have the NM capability of automatically generating and providing an integrated/ correlated presentation of network and all associated networks. The SUT met this requirement with the vendor's LoC.

(13) The UCR 2008, Change 2, paragraph 5.3.5.4, states that layer 2 switches must support IPv6 packets over Ethernet in accordance with RFC2464. The SUT met this requirement with both testing and the vendor LoC.

(14) The UCR 2008, Change 2, paragraphs 5.3.1.3.8, 5.3.1.5, 5.3.1.6, state that ASLAN components must meet security requirements. Security is tested by DISA-led Information Assurance test teams and published in a separate report, Reference (e).

c. System Interoperability Results. The SUT is certified for joint use within the Defense Information System Network (DISN) as layer 2 access switch. It is also certified with any digital switching systems listed on the UC APL which are certified for use with an ASLAN or non-ASLAN. The SUT is certified to support Assured Services within an ASLAN in accordance with the requirements set forth in the UCR. If a system meets the minimum requirements for an ASLAN, it also meets the lesser requirements for a non-ASLAN. Non-ASLANs are "commercial grade" and provide support to C2R or non-C2 voice subscribers. The SUT is certified for joint use as a non-ASLAN for C2R and non-C2 traffic. Non-ASLANs may provide MLPP to users authorized to originate only ROUTINE precedence calls but terminate all precedence levels. Non-ASLANs do not need to meet the availability or redundancy requirements of the Special C2 users or the C2 users capable of originating precedence calls above ROUTINE. Since non-ASLANs are not required to support the reliability requirements detailed in the UCR for ASLANs, C2 users and Special C2 users are not authorized to be served by a non-ASLAN.

12. TEST AND ANALYSIS REPORT. No detailed test report was developed in accordance with the Program Manager's request. JITC distributes interoperability information via the JITC Electronic Report Distribution (ERD) system, which uses Unclassified-But-Sensitive Internet Protocol Router Network (NIPRNet) e-mail. More comprehensive interoperability status information is available via the JITC System Tracking Program (STP). The STP is accessible by .mil/gov users on the NIPRNet at https://stp.fhu.disa.mil. Test reports, lessons learned, and related testing documents and references are on the JITC Joint Interoperability Tool (JIT) at http://jit.fhu.disa.mil (NIPRNet). Information related to DSN testing is on the Telecom Switched Services Interoperability (TSSI) website at http://jitc.fhu.disa.mil/tssi. Due to the sensitivity of the information, the Information Assurance Accreditation Package (IAAP) that contains the approved configuration and deployment guide must be requested directly through

government civilian or uniformed military personnel from the Unified Capabilities Certification Office (UCCO), e-mail: ucco@disa.mil.